AD-A036 885 NAVAL INTELLIGENCE SUPPORT CENTER WASHINGTON D C TRA--ETC F/G 8/10
TWO METHODS OF MEASURING THE SPECTRAL LIGHT TRANSMISSION COEFFI--ETC(U)
FEB 77 V I YEREMIN, G G KARLSEN, V N PELEVIN

UNCLASSIFIED NISC-TRANS-3893 NL

1 OF 1
AD
A036885

END
DATE
FILMED
4-77

ADA036885

DEPARTMENT OF THE NAVY
NAVAL INTELLIGENCE SUPPORT CENTER
TRANSLATION DIVISION
4301 SUITLAND ROAD
WASHINGTON, D.C. 20390

3

CLASSIFICATION: UNCLASSIFIED

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

TITLE: 6 Two Methods of Measuring the Spectral Light Transmission Coefficients of Seawater Layers of Considerable Thickness

(O dvukh metodakh izmereniya spektral'nykh koeffitsiyentov propuskaniya sveta znachitel'nymi tolshchami morskoy vody) 9

AUTHOR(S): 10 V. I. Yeremin, [redacted] G.G. Karlsen, [redacted] V.N. Pelevin [redacted]

PAGES: 5

SOURCE: Optika okeana i atmosfery, Institute of Oceanology of the USSR Academy of Sciences, "Nauka" Publishing House, Leningrad, 1972
Pages 120-125

DDC
RECEIVED
MAR 15 1977
A

ORIGINAL LANGUAGE: Russian

TRANSLATOR: C

14 NISC TRANS~~LATION NO.~~ 3893

APPROVED P.T.K.

11 DATE 1 Feb[redacted]77

12 6p.

407 682

COPY AVAILABLE TO DDC DOES NOT PERMIT FULLY LEGIBLE PRODUCTION

TWO METHODS OF MEASURING THE SPECTRAL LIGHT TRANSMISSION COEFFICIENTS OF SEAWATER LAYERS OF CONSIDERABLE THICKNESS

[Yeremin, V. I., G. G. Karlsen, and V. N. Pelevin, O dvukh metodakh izmereniya spektral'nykh koeffitsiyentov propuskaniya sveta znachitel'nymi tolshchami morskoy vody, in: Optics of the Ocean and Atmosphere (Optika okeana i atmosfery), Institute of Oceanology of the USSR Academy of Sciences, "Nauka" Publishing House, Leningrad, 1972, pp. 120-125; Russian]

It is well known that with increasing optical thickness of water, its spectral /120
light transmission band becomes increasingly narrower. The results of ordinary measurements of spectral transmission of light by seawater, performed on water samples or *in situ* with small measurement bases, are difficult to extend to layers of considerable thickness. This is due, in particular, to the fact that at large distances, a significant role is played by scattered light, whose effect is completely lost in measurements on small bases. It may be expected that not only will the spectral variation of the transmission curve depend on the optical thickness of the layer, but also the transmission maximum may be shifted.

The vertical daylight attenuation index is usually measured with detectors covered with colored filters of wide transmission band, comparable to the light transmission band of a thick layer of water, and this results in considerable errors. Therefore, in determining the transmission spectra, it is desirable to perform the measurements on considerable thicknesses of water, and the detector used should be an instrument with a high spectral resolution.

Special instruments were designed in two versions for use at night and in the daytime, a UM-2 monochromator being employed.

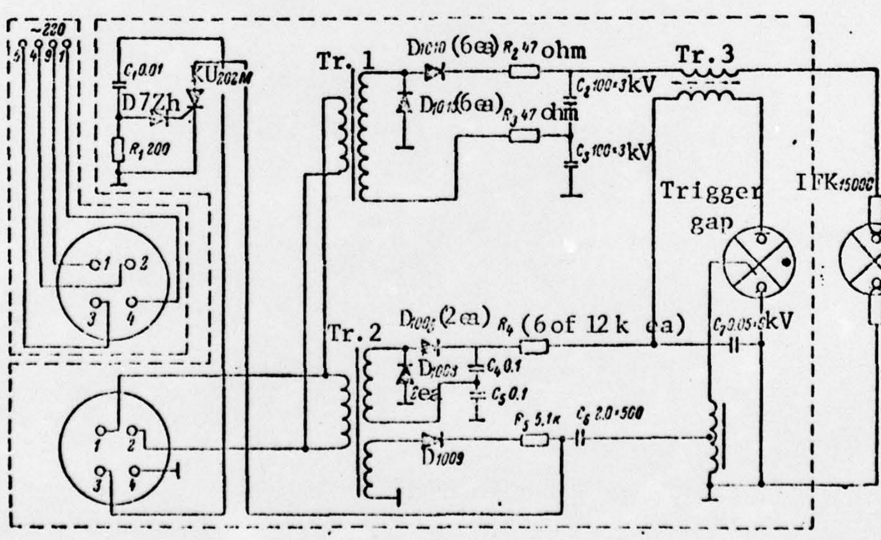

Fig. 1. Electric circuit of radiator

*Numbers in the right margin indicate pagination in the original text.

At night, use was made of a radiator consisting of an IFK-15000 xenon flash lamp placed at the focus of a parabolic mirror. The lamp was supplied from a powerful capacitor bank with a total capacitance of 50 μF, charged to a voltage of 6 kV; under these conditions, the length of a light pulse was 30-50 μsec. The lamp with the power supply were immersed to a specified level. The power supply /123 was placed in a container filled with oil and provided with a flexible diaphragm to equalize the pressure inside and outside the container. On the upper lid of the container were mounted a reflector and a lamp, bathed in water. The electric circuit of the radiator is shown in Fig. 1. The container is supplied from the ship by means of a KVD 4/1.5 low-voltage cable, from the unit controlling the underwater radiator (Fig. 2).

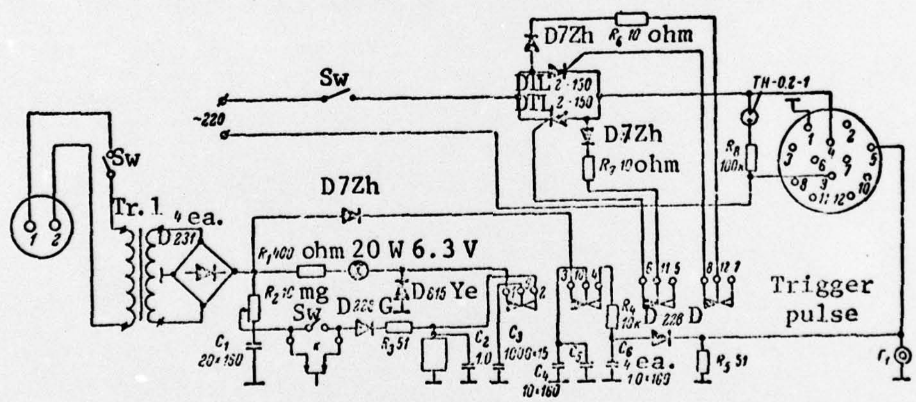

Fig. 2. Control unit of underwater radiator.

The detector is a UM-2 monochromator with an attachment mounted on its exit slit and containing an FEU-51 photomultiplier, single-stage amplifier, and cathode repeater with 6S6B and 6S31B tubes (Fig. 3). The amplified signal received is fed to the input of a triggered oscillograph; the beam deflection is triggered by a synchronizing pulse at the instant of emission of the light signal.

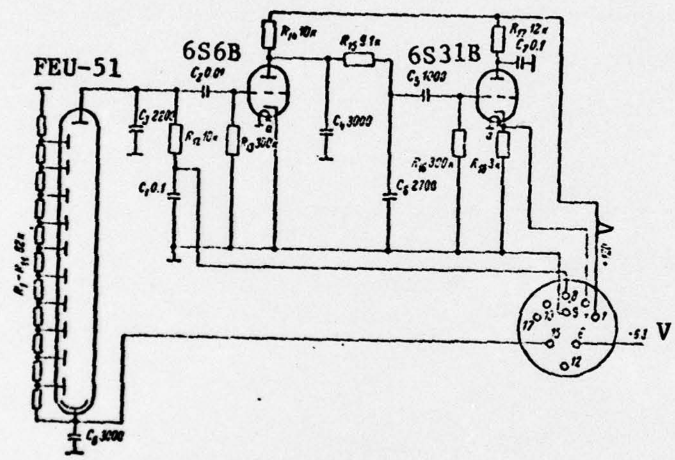

Fig. 3. Photodetector for UM-2 monochromator.

An example of a light transmission spectrum measured by this apparatus in waters of the Mediterranean Sea is shown in Fig. 4. The curves shown in the figure were obtained by dividing the curves representing the spectral distribution of the amplitudes of signals received from depth z_1 by the amplitudes of signals received from depth z_2. The indices next to the values of the spectral transmission coefficient T in Fig. 4 indicate the values of the depths z_1 and z_2 in meters: $z_1 > z_2$.

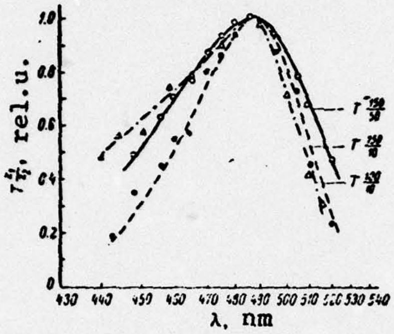

Fig. 4. Example of spectra of transmission $T \frac{z_1}{z_2}$ of light by considerable thicknesses of seawater.

$T \frac{100}{10}$ - waters of highest transparency.

The apparatus made it possible to immerse the radiation source to very appreciable depths (down to 420 m) and provided for reception of the signal in the 40 Å transmission band. /12

The sample results cited make it possible to estimate the transmission bandwidth of the corresponding water layers (under the conditions of the experiment, 50-65 nm at the 50% level) and the position of the tranmission maximum (close to 485 nm). These results give evidence of the suitability of the apparatus and method for systematic studies.

The light transmission coefficients of seawater were also measured in another way. A UM-2 monochromator with a photoelectric detector at the exit slit was immersed in water, and was used to measure the spectral daylight transmission coefficients of the sea.

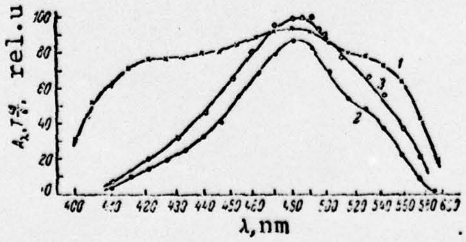

Fig. 5. Spectral composition of solar radiation at depths of 6 m (1), 40 m (2), and spectrum of sunlight transmission.

$T \frac{40}{6}$ (3) in waters of the Black Sea.

The spectral composition of solar radiation, measured with a submersible monochromator at depths of 6 and 40 m in one of the regions of the Black Sea, is shown in Fig. 5. The latter also gives the quotient of the spectra, representing the coefficient of transmission of solar radiation by a layer of water 34 m thick.

Thus, the first case involved measurement of the attenuation of a divergent light beam, and the second, the attenuation of an infinitely wide light beam. Naturally, it must not be required that the spectral variation of the transmission /125
coefficients be the same. Nevertheless, since we used the first method to study very large optical thicknesses, the major portion of the path traversed in water by the light beam between the source and the detector took place under depth or quasi-depth conditions, which are not sensitive to the geometric characteristics of light sources. On this basis, we believe that the results of measurements of the light transmission coefficients of thick layers of water by the two indicated methods should not differ appreciably.

The method of measurements with a submersible pulsed light source gives a greater scatter of experimental points due to the insufficient stability of the measuring channel and to the influence of the wavy sea surface, but, in addition to a simple measuring procedure, yields transmission coefficients down to depths of several hundred meters.